AF/2855
#19/Appeal Brief
5/15/03

PATENT

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPLICANT	:	Charles D. Snelling and Leo T. Van Lahr
SERIAL NO.	:	09/819,943
FILED	:	March 28, 2001
TITLE	:	APPARATUS FOR DETECTING THE INTERNAL LIQUID LEVEL IN A VESSEL
Group/A.U.	:	2855
Examiner	:	Michael T. CYGAN
Conf. No.	:	2958
Docket No.	:	P06485US0

Box BPAI
Commissioner for Patents and Trademarks
Washington, D.C. 20231

APPEAL BRIEF

Dear Sir:

This is an Appeal from the rejection of claims 1-3 and 9-17 (Final Office Action dated December 19, 2002), and the subsequent Advisory Actions dated January 14, 2003 and April 4, 2003. This brief is submitted pursuant to 37 CFR §1.192 in furtherance of the Notice of Appeal filed for this case on April 18, 2003.

I. Real Party in Interest:

The real party in interest of this instant appeal is Charles D. Snelling and Leo T. Van Lahr.

CERTIFICATE OF MAILING (37 C.F.R. § 1.8(A))

I hereby certify that this document and the documents referred to as enclose therein are being deposited with the United States Postal Service as First Class mail addressed to: Box BPAI, Assistant Commissioner for Patents, Washington, D.C. 20231, on this 5th day of May, 2003.

Donald H. Zarley

II. Related Appeals and Interferences:

The present application is a continuation-in-part patent application of U.S. patent application serial no. 09/800,259, which had an appeal brief filed on April 1, 2003.

III. Status of the Claims:

Claims 1-3 and 5-17 are pending in the application. Claims 1-3 and 9-17 stand as finally rejected (Final Office Action dated December 19, 2002). Claim 4 was canceled in the November 25, 2002 Amendment. Claims 5-8 have been allowed. Claims 1-3 and 9-17 are hereby identified as the claims being appealed.

IV. Status of the Amendments:

Applicant's Amendment to Claim 11 of March 10, 2003 was filed subsequent to the final rejection. This Amendment was not entered by the Examiner, as indicated in the April 4, 2003 Advisory Action.

V. Summary of the Invention:

The present invention provides an internal liquid level detector system 20 and method for detecting the level of a liquid in a vessel 22. (See the Specification at Pg. 5, lines 25-29). In general, the detector system 20 includes a detector assembly 27 associated with the vessel 22. (Pg. 8, lines 6-10). The detector assembly 27 has an elongate thermally conductive substrate which may be constituted by a

tubular housing 30 formed of **metal, which is a thermally conductive material**. (Pg. 8, lines 6-10). The heater 40 is a strip heater mounted on inner surface 39 the housing 30 such that heat from the element is thermally connected to the interior of the vessel 22 in which liquid and vapor is contained. (Pg. 8, line 27 - Pg. 9, line 16). Accordingly, the heater 40 does not directly contact the liquid or vapor within the vessel 22. (Pg. 9, lines 5-6).

A sensor 57 is mounted on the inner surface 39 of the housing 30 in proximity to the heater 40. (Pg. 9, lines 19-22). Accordingly, the sensor 57 does not directly contact the liquid or vapor within the vessel 22. (Pg. 9, lines 22-24). The sensor 57 comprises a potentiometer (variable resistance means) in which the resistance to electrical conductivity varies in proportion to the temperature detected by the sensor. (Pg. 9, lines 24-26). The sensor 57 has a vertical dimension sufficiently large such that the temperature signal will vary in proportion to the longitudinal portion of the sensor thermally connected to liquid. (Pg. 11, lines 7-11).

The sensor 57 constitutes an intermediate sensor 57 when disposed between upper and lower sensors 65 and 67. (Pg. 11, lines 13-19). The upper and lower sensors 65, 67 each have a vertical dimension generally equivalent to a single longitudinal portion of the intermediate sensor 57. (Pg. 11, lines 18-21). The upper and lower sensors 65, 67 are each mounted on the housing 30 in proximity to the ends of heater 40. (Pg. 12, lines 1-2).

The system 20 includes a processor 70 electrically connected to each of the sensors 57, 65, and 67 for receiving the respective individual temperature signals resulting from actuation of the heater 40. (Pg. 12, lines 18-21).

In operation, the heater 40 is actuated to add heat to the thermally conductive housing 30 adjacent to the sensors 57, 65, and 67. (Pg. 12, lines 23-26). The temperature of the portion of sensors 57, 65, and 67 below the liquid level will change little while the temperature of the portion of sensors 57, 65, and 67 above the liquid level will change a known number of degrees. (Pg. 12, line 28 - Pg. 13, line 4). The individual temperature signals from each of the sensors 57, 65, 67 are transmitted to the processor 70. (Pg. 13, lines 8-10). The processor 70 will use these individual temperature signals to calculate the level of the liquid in the vessel 22. (Pg. 15, lines 3-5).

The processor 70 is programmed to determine the elevation of the liquid upper surface relative to the upper and lower ends 72 and 75 of the intermediate sensor 57. (Pg. 20, lines 35-37). This may be done by various methods disclosed. The processor 70 also compares the signal from intermediate sensor 57 to the temperature signals from upper and lower sensors 65 and 67. (Pg. 23, lines 17-22). For example, if the temperature signal from intermediate sensor 57 is closer to the reference "vapor" temperature signal from the upper sensor 65, as compared to the reference "liquid" temperature signal from the lower sensor 67, then the liquid upper surface is closer to the lower end 75 of the intermediate sensor 57. (Pg. 23, lines 22-27).

VI. Issues:

Issue 1: Whether claims 1, 2, 9-11, and 13-17 are anticipated by Peterson (U.S. Patent No. 3,485,100).

VII. Grouping of the Claims:

Group I and II are independently patentable, and their patentability will not rise or fall together.

Group I: Claims 1-3, 9, and 13-17. Claim 1 is an independent apparatus claim and claims 2, 3, 9, 10 and 15 depend therefrom. Claim 13 is an independent apparatus claim and claim 14 depends therefrom. Claim 16 is an independent apparatus claim and claim 17 depends therefrom. Thus, claims 1-3, 9-10, 13-14 and 16-17 are grouped to rise and fall together.

Group II: Claims 11 and 12. Claim 11 is an independent apparatus claim and claim 12 depends therefrom; thus, claims 11 and 12 are grouped to rise and fall together.

The arguments below support the separate patentability of these claims.

VIII. Argument:

Issue 1: Whether 1, 2, 9-11, and 13-17 (Group I and Group II) are anticipated by Peterson.

A. Group I and Group II Are Not Anticipated Because Each And Every Element Of The Claimed Invention Is Not Identically Shown In The Reference

The Examiner states that Peterson discloses the claimed invention, a detector assembly 5 including a thermally conductive substrate 30 on which is mounted a heater 33 and an elongated temperature-dependant resistance sensor 34 in such a way that the heater adds heat to the vessel and the sensor element responds to temperatures at discrete vertical elevations of the vessel. (See the Final Office Action dated

December 19, 2002, Pg. 2). The Examiner has later stated that Petersen discloses heat transfer through the rod to be "very good," therefore it must be heat conductive. (Advisory Action dated April 4, 2003).

Applicant asserts that the Examiner has failed to make a prima facie case for anticipation for the following reasons:

(1) For prior art references to be anticipated under 35 U.S.C. § 102, each and every element of the claimed invention must be identically shown in the reference. Peterson does not disclose the limitation found in independent claims 1, 11, 13 and 16 reciting a "thermally conductive substrate". The Examiner states that Peterson discloses "a thermally conductive substrate (30)". However, Peterson (at column 4, lines 29-38) states that rod 30 is composed "insulating material". The Examiner counters that Petersen discloses heat transfer through the rod to be "very good," therefore it must be heat conductive.

Applicant submits that there is no such thing as a perfect insulator or a perfect conductor. Since it is given that the rod 30 of Peterson must have a certain degree of thermal conductivity, the fact that Peterson describes rod 30 as being composed of "insulating material" is determinative of whether the rod 30 is a "thermally conductive substrate" or not. Further, Peterson goes on to say that the heat-transfer in the longitudinal direction is poor on account of the small cross-sectional area. (At column 4, lines 29-38). Thus, the heat-transfer in the rod 30 is poor in some respects preventing it from being interpreted as a "thermally conductive substrate", which would have good heat-transfer in any dimension. Since rod 30 of Peterson is composed of "insulating material" and has poor heat-transfer in the longitudinal direction, it is incapable of anticipating the

recitation of a "thermally conductive substrate" in Applicant's claims 1, 11, 13 and 16. Accordingly, these claims are not anticipated by Peterson.

(2) Further, Applicant cautions that any attempt to cure Peterson of its above deficiencies in the 102 rejection will fail because Peterson explicitly teaches away from using a substrate that is "thermally conductive", since Peterson requires that rod 30 be composed of "insulating material" and that the rod 30 must have poor heat-transfer in the longitudinal direction (Peterson at column 4, lines 29-38). Due to this teaching away, there can be no cure for Peterson's failure to teach or suggest all of the claim limitations of independent claims 1, 11, 13, and 16. Accordingly, these independent claims would not be rendered obvious by Peterson.

B. Group II Is Not Anticipated Because Each And Every Element Of The Claimed Invention Is Not Identically Shown In The Reference

The Examiner states that Peterson discloses the claimed invention, a detector assembly 5 including a thermally conductive substrate 30 on which is mounted a heater 33 and an elongated temperature-dependant resistance sensor 34 in such a way that the heater adds heat to the vessel and the sensor element responds to temperatures at discrete vertical elevations of the vessel. (See the Final Office Action dated December 19, 2002, Pg. 2). Further, upper and lower temperature-dependant sensors 26 and 29 can be used to surround an elongated temperature-dependant sensor 27 or 28. (Final Office Action dated December 19, 2002, Pg. 3). The Examiner has later stated that Petersen discloses that each

sensor provides an individual signal which is then summed. (Advisory Action dated April 4, 2003).

Applicant asserts that the Examiner has failed to make a prima facie case for anticipation for the following reasons:

For prior art references to be anticipated under 35 U.S.C. § 102, each and every element of the claimed invention must be identically shown in the reference. Peterson does not disclose the limitation of Applicant's independent claim 11 reciting that there be "upper, intermediate and lower sensors mounting on said substrate … said intermediate sensor having a vertical dimension sufficiently large such that said temperature signal will vary in proportion to said longitudinal portion of said intermediate sensor thermally coupled to the liquid". The Examiner alternatively cites resistor 34 or resistors (27 or 28) of Peterson as being "an elongated temperature-dependent resistance sensor" and cites resistors 26 and 29 as upper and lower temperature-dependant sensors surrounding an elongated temperature-dependant sensor 27 or 28.

(1) Regarding the Examiner's citation of element 34 of Petersen as teaching an elongated temperature-dependent resistance sensor, Applicant asserts that the embodiment shown in Petersen FIGS. 5-7 (element 34) does not have upper and lower sensors, as recited in Applicant's claim 11. Further, the embodiment shown in Petersen FIG. 4, which the Examiner cites as teaching upper and lower temperature-dependant resistors 26 and 29 is not the same embodiment as FIGS. 5-7, and does not include element 34. Since FIG. 4 and FIGS. 5-7 are not the same embodiment and none include all three elements 34, 26 and 29 of Petersen, there can be no anticipation of claim 11 based on elements 34, 26 and 29.

Further, Applicant cautions any attempts to cure Peterson of its above deficiencies in the 102 rejection will fail because Peterson explicitly teaches element 34 as part of one embodiment while 26 and 29 are part of an alternative embodiment replacing element 34. Since Petersen teaches replacing element 34 with 26-29, Petersen teaches away from combining element 34 with elements 26 and 29. Due to this teaching away, there can be no cure for Peterson's failure to teach or suggest all of the claim limitations of independent claim 11. Accordingly, independent claim 11 is would not be rendered obvious by Peterson.

(2) Regarding the Examiner's citation of element (27 or 28) of Petersen as teaching an elongated temperature-dependent resistance sensor, Petersen shows three embodiments in FIG. 2, FIG. 3, and FIG. 4. The FIG. 4 embodiment is the one in question here, since it includes resistors 27 or 28 as part of a series of resistors 26-29. Petersen does not specifically discuss the properties of resistors 26-29; however, Petersen does discuss a similar set of resistors 18-21 in the FIG. 3 embodiment. It is clear that the resistors 26-29 in FIG. 4 are the same as the resistors 18-21 in the FIG. 3 embodiment. The only distinction between the FIG. 3 and FIG. 4 embodiments is the addition of bimetal switches 22-25 in FIG. 4. Thus, the disclosure regarding resistors 18-21 in the FIG. 3 is relevant to the properties of resistors 26-29 in FIG. 4.

Peterson states that resistors 18-21 "determine a certain number of definite levels"; the resistors be "discreet"; and that they are fitted at vertical positions to correspond to a liquid level in question. (Peterson column 4, lines 5-11). Further, Peterson distinguishes these sensors from an alternative embodiment shown in FIG. 2, where the resistor element 8 has a resistance that "changes continuously with

temperature" (Peterson column 3, lines 29-35), stating that "[w]hilst the connection shown in FIG. 2 enables **any** required liquid level to be measured, in many cases it suffices to determine a **certain number of definite levels**. In the embodiment shown in FIG. 3, therefore, the resistor element 8 is **replaced** by four **discrete series-connected separate sensors 18-21…**". (Emphasis added, Peterson column 4, lines 5-11). Thus, Peterson distinguishes the embodiment of FIG. 3 from FIG. 2, stating that element 8 of FIG. 2 is replaced with a series of discrete separate sensors. As resistors 27 or 28 of FIG. 4 are the same as resistors 19 and 20 of FIG. 3, resistors 27 or 28 also determine a certain number of definite levels but they do not determine any required liquid level as does element 8 of FIG. 2. Accordingly, resistors 27 or 28 of Peterson do not meet the requirements of Applicant's claim 11 that "said intermediate sensor having a vertical dimension sufficiently large such that said temperature signal will vary in proportion to said longitudinal portion of said intermediate sensor thermally coupled to the liquid". Accordingly, independent claim 11 is not anticipated by Peterson.

Further, Applicant cautions any attempts to cure Peterson of its above deficiencies in the 102 rejection will fail because Peterson explicitly teaches one embodiment having resistors 27 or 28 while element 8 is part of an alternative embodiment replacing resistors 26-29. Petersen teaches that element 8 enables any required liquid level to be measured, and that element 8 can be replace with discrete resistors 26-29 which determine a certain number of definite levels. Since Petersen teaches either determining any required liquid level with a continuous element 8 or determine a certain number of definite levels with discrete resistors 26-29, Petersen

teaches away from combining elements to have both an "upper, intermediate and lower sensors mounting on said substrate" and that "said intermediate sensor having a vertical dimension sufficiently large such that said temperature signal will vary in proportion to said longitudinal portion of said intermediate sensor thermally coupled to the liquid", as recited in claim 11. Due to this teaching away, there can be no cure for Peterson's failure to teach or suggest all of the claim limitations of independent claim 11. Accordingly, independent claim 11 would not be rendered obvious by Peterson.

(3) Additionally, claim 11 is not anticipated because Peterson does not disclose the limitation of claim 11 reciting that the upper and lower sensors "generate respective electrical signals each defining a temperature signal" and that the processor "use said temperature signals to calculate the elevation". The Examiner cites the Peterson resistors 26 and 29 as teaching upper and lower temperature dependent resistance sensors, and later states that Petersen discloses that each sensor provides an individual signal which is then summed. However, claim 11 does not only require each of the upper and lower sensors to "generate respective electrical signals"; claim 11 also requires that the electrical signals each define "a temperature signal" and that the processor "use said temperature signals to calculate the elevation". Conversely, resistors 26 and 29 of Petersen do not each define a temperature signal as required by Applicant's claim 11; instead the resistors 26-29 operate in series to generate a single temperature signal (Peterson column 4, lines 8-17), thus there is not a plurality of "temperature signals" generated as recited in claim 11. Accordingly, independent claim 11 is not anticipated by Peterson.

Further, Applicant cautions any attempts to cure Peterson of its above deficiencies in the 102 rejection will fail because Peterson explicitly teaches wiring the resistors in series. Due to this teaching away, there can be no cure for Peterson's failure to teach or suggest all of the claim limitations of independent claim 11. Accordingly, independent claim 11 would not be rendered obvious by Peterson.

IX. Conclusion:

In view of the above arguments, Applicant believes that appealed claims 1-3 and 9-17 are in condition for allowance and Applicant respectfully requests reversal of the Final Office Action and allowance of such claims.

Any fees or extensions of time believed to be due in connection with this appeal are enclosed; however, consider this a request for any fee or extension inadvertently omitted, and charge any additional fees to Deposit Account 50-2098.

Respectfully submitted,

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APPENDIX A

Pending Claims

1. A system for detecting the level of liquid in a vessel, comprising:

a detector assembly including

a thermally conductive substrate,

a heater mounted on said substrate such that said heater is thermally coupled to the interior of the vessel, said heater being able to be actuated to add heat to the surface of the substrate thermally coupled to the interior of the vessel, and

a sensor mounted on said substrate in proximity to said heater such that discrete elevations of the interior of the vessel are thermally coupled to corresponding longitudinal portions of said sensor to generate an electrical signal defining a temperature signal, said correspondence being incrementally continuous such that the elevations corresponding to said portions of said sensor increase from one to the other of the ends of said sensor, said sensor being able to be actuated to detect the temperature in the vessel in proximity to the sensor indicative of the temperature detected by said sensor, said sensor having a vertical dimension sufficiently large such that said temperature signal will vary in proportion to said longitudinal portion of said sensor thermally coupled to the liquid;

a processor electrically connected to said sensor for receiving said temperature signal after actuation of said heater, said processor being programmed to use said temperature signal to calculate the elevation of

the upper surface of the liquid in the vessel thereby to generate an electrical signal defining an elevation signal indicative of the elevation of the liquid upper surface relative to the lower end of said sensor;

an interface electrically connected to said processor for receiving said elevation signal for use as the basis for communicating to the user the elevation of the liquid upper surface; and

a power supply electrically connected to said heater, sensor, processor, and interface, and wherein said sensor comprises a variable resistance means wherein the resistance to electrical conductivity of said sensor varies in proportion to the temperature detected by it, said temperature signal being of a magnitude proportional to the magnitude of the resistance, said programming of said processor comprising using said temperature signal to measure said resistance of said sensor, said programming further comprising using said resistance to calculate the elevation of the upper surface of the liquid.

2. A system as set forth in claim 1, wherein said longitudinal portions of said sensor define a longitudinal axis of said sensor having a vertical orientation.

3. A system as set forth in claim 1, wherein said lower end of said sensor is positioned above the lower inner surface of the vessel by a vertical clearance, said processor being programmed further to interpret the elevation signal to be indicative of the elevation of the liquid upper surface relative to the lower end of said sensor and of said vertical clearance such that said

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interface communicates to the user the elevation of the liquid upper surface relative to the lower inner surface of the vessel.

9. A system as set forth in claim 1, wherein said heater is constituted by said sensor.

10. A system as set forth in claim 1, wherein said sensor is disposed in the interior of the vessel.

11. A system for detecting the level of liquid in a vessel, comprising:

a detector assembly including a thermally conductive substrate,

a heater mounted on said substrate such that said heater is thermally coupled to the interior of the vessel, said heater being able to be actuated to add heat to the surface of the substrate thermally coupled to the interior of the vessel, and

upper, intermediate and lower sensors mounted on said substrate in proximity to said heater, said upper sensor being at a higher elevation relative to said lower sensor, said intermediate sensor being at an elevation between said upper and lower sensors, said upper and lower sensors being thermally coupled to the interior of the vessel to detect the temperature therein in proximity to said upper and lower sensors, said upper and lower sensors being able to be actuated to generate respective electrical signals each defining a temperature signal indicative of said temperatures detected by said upper and lower sensors, said intermediate sensor being mounted on said

substrate such that discrete elevations of the interior of the vessel are thermally coupled to corresponding longitudinal portions of said intermediate sensor to detect the temperature in the vessel in proximity to the sensor, said correspondence being incrementally continuous such that the elevations corresponding to said portions of said intermediate sensor increase from one to the other of the ends of said intermediate sensor, said intermediate sensor being able to be actuated to generate an electrical signal defining a temperature signal indicative of the temperature detected by said intermediate sensor, said intermediate sensor having a vertical dimension sufficiently large such that said temperature signal will vary in proportion to said longitudinal portion of said intermediate sensor thermally coupled to the liquid;

a processor electrically connected to each of said sensors for receiving said temperature signals after actuation of said heater, said processor being programmed to use said temperature signals to calculate the elevation of the upper surface of the liquid in the vessel thereby to generate an electrical signal defining an elevation signal indicative of the elevation of the liquid upper surface;

an interface electrically connected to said processor for receiving said elevation signal for use as the basis for communicating to the user the elevation of the liquid upper surface; and

a power supply electrically connected to said heater, intermediate sensor, lower sensor, upper sensor, processor, and interface, and

wherein said sensor comprises a potentiometer wherein the resistance to electrical conductivity of said sensor varies in proportion to the temperature detected by it, said temperature signal being equal to said resistance, said programming of said processor comprising using said temperature signal to measure said resistance of said sensor, said programming further comprising using said resistance to calculate the elevation of the liquid upper surface.

12. A system as set forth in claim 11, wherein said processor comprises an electronic microprocessor.

13. A system for detecting the level of liquid in a vessel, comprising:

a detector assembly including a thermally conductive substrate;

a heater mounted on said substrate such that the heater is thermally coupled to the interior of the vessel, the heater being able to be actuated to add heat to the surface of the substrate thermally coupled to the interior of the vessel;

an elongated electrical resistance-type sensor mounted on the substrate in proximity to said heater such that discrete elevations of the interior of the vessel are thermally coupled to corresponding longitudinal portions of the sensor to generate electrical signal defining a temperature signal at various elevations in the vessel, the longitudinal portions being incrementally continuous such that the elevations corresponding to the longitudinal portions increase along a length of the sensor, the sensor being able to

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be actuated to detect the temperature in the vessel at discrete elevations of the interior of the vessel at elevations where liquids in the vessel are thermally coupled to the liquid;

a processor electrically connected to the sensor for receiving the temperature signal after actuation of said heater, the processor being programmed to use the temperature signal to calculate the elevation of the upper surface of the liquid in the vessel to generate a further electrical signal defining an elevation signal indicative of the elevation of the upper surface of the liquid; and

an interface electrically connected to said processor for receiving said elevation signal to communicate to the user the elevation of the upper surface of the liquid.

14. The system of claim 13 wherein a power supply is electrically connected to the heater, sensor, processor, and interface, and wherein said sensor comprises a variable resistance means wherein the resistance to electrical conductivity of the sensor varies in proportion to the temperature detected by it, the temperature signal being of a magnitude proportional to the magnitude of the resistance, the programming of said processor comprising using the temperature signal to measure said resistance of the sensor, the programming further comprising using the resistance to calculate to calculate the elevation of the liquid upper surface of the liquid.

15. The system of claim 1 wherein the variable resistance means is a potentiometer.

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16. A method of detecting the level of liquid in a vessel comprising:

providing a thermally conductive substrate to the interior of a vessel to contain a liquid,

mounting a heater to the substrate such that the heater is thermally coupled to the interior of the vessel, the heater being able to be actuated to add heat to the surface of the substrate thermally coupled to the interior of the vessel;

mounting an elongated electrical resistance-type sensor the substrate in proximity to the a heater mounted on said substrate such that the heater is thermally coupled to the interior of the vessel, the heater being able to be actuated to add heat to the surface of the substrate thermally coupled to the interior of the vessel;

electrically connecting a processor to the sensor for receiving the temperature signal after actuation of said heater, the processor being programmed to use the temperature signal to calculate the elevation of the upper surface of the liquid in the vessel to generate a further electrical signal defining an elevation signal indicative of the elevation of the upper surface of the liquid; and

electrically connecting and interface to the processor for to communicate to the user the elevation of the upper surface of the liquid.

17. The method of claim 16 wherein a power supply is electrically connected to the heater, sensor, processor, and interface, and wherein said sensor comprises a variable resistance means wherein the resistance to electrical

conductivity of the sensor varies in proportion to the temperature detected by it, the temperature signal being of a magnitude proportional to the magnitude of the resistance, the programming of said processor comprising using the temperature signal to measure said resistance of the sensor, the programming further comprising using the resistance to calculate to calculate the elevation of the liquid upper surface of the liquid.